Space Weather Forecast

Issued on Monday, 30 January 2023 at 12:36 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of Minor Geomagnetic Storm G1 from fast wind brought forward, probably peaking UTC days Tuesday into Wednesday.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been low over the last 24 hours, with X-ray activity comprising low-level Common-class flares that became more frequent to end the period, peaking at 30/0610UTC. The source was muddied by concurrent activity in a northeastern 'filament' (arc of plasma on the Sun) and a newly-arriving sunspot on the southeastern solar horizon.

There were otherwise four sunspot regions on the Sun, with these mostly small magnetically bipolar regions. The main activity was seen in the southwest which saw areal growth some proliferation of spots and spreading, while a second sunspot region in the southeast saw intermediate spot proliferation.

Satellite imagery available for the period suggests a large southwest-directed series of Coronal Mass Ejections (i.e. below and ahead of the Earth in the track of its orbit) that may possibly relate to a 'prominence lift off' (arc of plasma on the Sun's edge) at low latitude, although some of the obtained modelling solutions suggest this may be angled towards the far side. In any case, no Earth-based effects are expected. Additionally, satellite imagery is showing an apparently mainly southeastward-directed CME (behind and below the Earth's orbital track), although again this is possibly far-sided from provisional analysis. At present then, there remain no Earth-directed CMEs in evidence.

Solar Wind / Geomagnetic Activity: The solar wind is suggestive of Earth's exit from a fast wind into a nominal slow solar wind regime. The solar wind speed showed a gradual decline through the period, falling through Slightly Elevated levels in the 24 hours. The number of particles in the solar wind showed a shallower decline, remaining within normal levels. The associated magnetic field showed smooth and small-scale variation, with a variable north-south component (i.e. co- or anti-aligned with Earth's field to lesser or greater effect).

The net effect of the above solar wind measures was provisionally quiet geomagnetic activity throughout, well below Minor Geomagnetic Storm G1.

Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be predominantly Low, with a daily slight chance of isolated Moderate-class X-ray flares. The probable direction of X-ray activity is upward over the four days, however the degree to which this occurs remains to be seen pending new sunspot arrivals.

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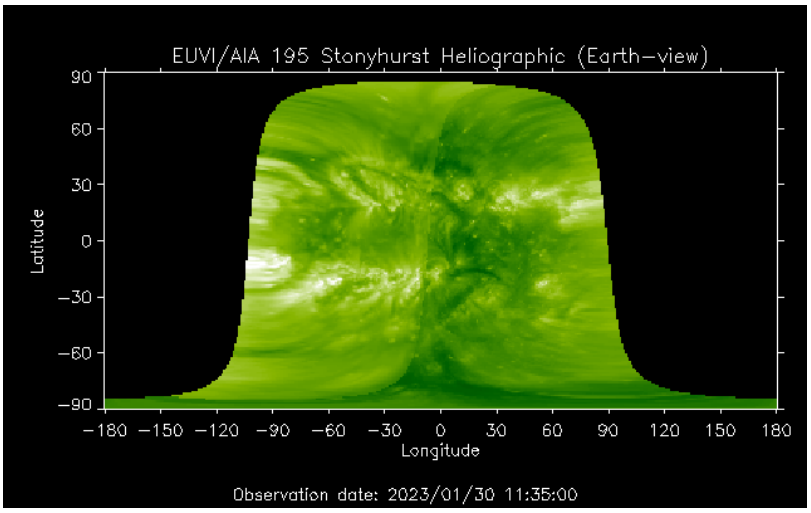
Figure 1: False colour extreme-UV imagery showing the impending eastern solar horizon at Earth from STEREO A's perspective between -90 and -105 (i.e. East). Note the bright flux in the south which may correspond to a returning sunspot group that may serve to increase X-ray activity.



Solar Wind / Geomagnetic Activity: No Earth-directed CMEs feature in the forecast. A fast wind is potentially now showing at a satellite around a day upwind of Earth, which would imply an affect at Earth from day two, Tuesday 31 January. This may give a chance of Minor Geomagnetic Storm G1, perhaps continuing into day three before beginning to wane.

Energetic Particles / Solar Radiation: No solar radiations storms are expected given the relative lack of complex sunspots on the Sun at present.

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	25	25	1
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

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Radio Blackouts - X Ray Flares:

X Ray Flares	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability			(%)	(%)	(%)	(%)
Active	R1-R2 M Class	No	10	10	10	10
Very Active	R3 to R5 X	No	1	1	1	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC)	Day 2 (00-24 UTC)	Day 3 (00-24 UTC)	Day 4 (00-24 UTC)
Probability (Exceedance)			(%)	(%)	(%)	(%)
Active	≥ S1	No	1	1	1	1
Very Active	≥ S3 *	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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